REMARKS

The application has been thoroughly reviewed in light of the outstanding Office Action dated January 20, 2004. Claims 1-4 and 6-38 are currently pending, with claims 1, 24, 25, 33, 34, 35 and 38 being independent. The specification has been amended to correct two informalities. Claims 5, 39 and 40 have been canceled without prejudice and/or disclaimer of subject matter. Claims 1, 7, 9, 10, 13, 14, 16, 17, 25, 31, 33, 34, 36 and 37 have been amended. No new subject matter has been added to either the specification or claims. Each of the points raised in the outstanding Action are addressed below.

Allowable Subject Matter

Applicants appreciate the indication by the Examiner that claim 22 would be allowable over the art of record if re-written in independent form in to include the all of the features of the base independent claim and any intervening claims. However, since Applicants believe the base independent claim is patentable over the prior art, claim 22 has not been amended.

Information Disclosure Statement

The Action indicates the U.S. patent 5,559,638, which was listed on a PTO-1449 form with Applicants' Information Disclosure Statement filed on April 23, 2002 was not considered, since the subject matter of that patent was unrelated to the current application. The Action indicated that Applicants may have been referring to U.S. patent 5,599,638.

In that regard, the Examiner's premonition was correct, as the intended patent for disclosure was U.S. patent 5,599,638. Applicants apologize for the typographical error on the PTO-1449 form, but submit that the first page of Applicants' Information Disclosure Statement correctly identified this patent as U.S. Patent No. 5,599,638. Moreover, a copy of the correct patent was enclosed with Applicants Information Disclosure Statement. Thus, Applicants are at

a loss to understand why the Examiner did not simply correct the PTO-1449 form by hand, so that the issue could have been resolved.

However, in an effort to resolve the issue, Applicants hereby submit substitute PTO-1449 form with the corrected patent number, as well as another copy of U.S. patent 5,599,638, for inclusion into the Application file at the Patent and Trademark Office and consideration by the Examiner. Applicants' respectfully request that this PTO-1449 form be initialed by the Examiner and a copy returned to Applicants for their records.

Drawings

The drawings were objected to as not disclosing all the features recited in claim 5. Applicants have canceled claim 5 (without prejudice and disclaimer of subject matter), and thus, Applicants submit that this objection has been rendered moot.

Objection To The Specification

The specification was objected to for failing to provide proper antecedent basis for all the features recited in claim 5, and the term "substantial" as recited in claim 7. In that regard, Applicants have canceled claim 5, and deleted the term "substantial" from claim 7. Thus, Applicants submit that this objection is also now moot.

Claim Objections

Claims 16 and 17 were objected to for the informality noted on page 3 of the Action. Applicants have addressed the informality, and respectfully request withdrawal of this objection.

Claim 7 was objected to for the use of the term "substantial" in the claim. While not addressing the merits of the Examiner's position as whether or not this term renders the claim indefinite, Applicants have amended the claim to delete this term.

Rejection of the Claims Under 35 U.S.C. §112, first paragraph

Claim 14 was rejected for the use of the tradename "ZINTEX". Applicants have amended this claim to correct the spelling of the originally intended material, ZITEX®. In that regard, the specification was amended to correct this informality. No new matter was added. For the Examiner's convenience, Applicants enclose herein a description of the product (Exhibit A), which was obtained from the manufacturer's website.

As noted on the Exhibit, it is obvious that Applicants intended that the material to be "Zitex" and not Zintex, since the former refers to a material for use as a gas separating material. Specifically, as noted on the sixth (6^{th}) full paragraph, page 1 of Exhibit A, "Zitex membranes are inherently hydrophobic, which makes them idea as venting devices." This correlates to Applicants description in the corresponding section of the disclosure regarding the "gas separating second material". See page 18, line 9. Moreover, no documents were found to correspond to such a material on a web related search for Zintex material. Thus, Applicants submit that this mistake is an obvious error in the disclosure, and one of skill in the art would readily understand that the Applicants intended the use of the material "Zitex".

Accordingly, Applicants respectfully submit that this claim is fully supported by the specification, and thus, Applicants respectfully request that this rejection as to claim 14 be withdrawn.

Claim 13 was rejected because of the material term, "polyvaniladine", which the Action indicates is not held to be a material known to one of ordinary skill in the art. Applicants respectfully submit that this term as recited in the specification and claims was misspelled. Accordingly, as the Action correctly indicates, the correct spelling of the term is:

polyvinylidine. In that regard, the specification and corresponding claims have been amended to correct this misspelling.

Rejection of Claims Under§ 112

Claims 9, 10, 14, 31, 37 and 40 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for the reasons set out on pages 5-6 of the Action. Claim 40 has been canceled, thus the rejection as to this claim is considered moot. With regard to remainder of the claims in this rejection, Applicants have reviewed all the claims and amended some claims where necessary to address the Action's concerns. Thus, Applicants submit that all the claims now conform to the requirements of §112, second paragraph. Withdrawal of this rejection is respectfully requested.

§102 Rejections

Claims 1-3, 5-9, 10, 13, 15, 17-19-21, 23, 24 and 33 were rejected as being anticipated in view of various prior art: U.S. patent 5,547,551 (Bahar et al.), EP 577291A (Hards et al.), U.S. patent 5,945,231 (Narayanan), U.S. patent 6,456,136 (Fenton et al.), U.S. patent 6,015,610 (Minor). For the following reasons, Applicants submit that the claims are patentable over the cited art.

The Claimed Invention

Claim 1 is directed to a membrane electrolyte for a fuel cell comprising a first material for conducting protons from a first side of the membrane to a second side of the membrane and a second material organized and arranged in one or more predetermined locations through the first material for conducting gas from the first side of the membrane to the second side of the membrane. Claim 33 recites the same patentable features.

Claim 24 is directed to a membrane for a fuel cell having a first material for conducting protons from a first side of the membrane to a second side of the membrane and a vent having a first end in communication with the first side of the membrane and a second end in communication with the second side of the membrane. The vent conducts a gas from the first side to the second side.

The Prior Art

As understood by Applicants, Bahar et al. is directed to an ultra-thin integral composite membrane which is air impermeable. In particular, this invention disclosed in Bahar et al. is for strengthening a thin ion exchange membrane, which is also air impermeable. The disclosed membrane is a combination of an expanded Teflon (ePTFE) base material, having a porous microstructure, and an ion exchange material/resin which impregnates the base material making the composite membrane air impermeable.

Hards et al. is understood to disclose a high performance porous electrode for use in a membrane electrode assembly for fuel cells, having low platinum load and improved platinum utilization. It includes a gas diffusion layer so that a gas (e.g., oxygen) may be diffused over a side of a membrane electrolyte to which the porous electrode is used.

Narayanan et al. is understood by Applicants to disclose a direct liquid-feed fuel cell having a solid membrane electrolyte. A membrane electrolyte conducts protons while a vent 127 allows CO_2 to vent out of the anode chamber.

Fenton et al. is understood by Applicants to disclose a composite membrane structure including a porous polymeric matrix and an ionically conductive solid, noble metal dispersed within the matrix and a binder. The structure may be used with a membrane electrode assembly.

Minor et al. is understood to disclose a thin, light reflectant surface and method for

manufacture which includes an expanded PTFE material.

Analysis

After a thorough review of the cited prior art, Applicants could find nothing in any of the cited references which disclose a membrane electrolyte for a fuel cell, having a first material for conducting protons from a first side of the membrane to a second side of the membrane and a second material organized and arranged in one or more predetermined locations through the first material for conducting gas from the first side of the membrane to the second side of the membrane.

Moreover, with regard to claim 24, none of the references disclose a first material for conducting protons from one side to the other of a membrane electrolyte and a vent having a first end in communication with the first side of the membrane and a second end in communication with the second side of the membrane, where gas is conducted from the first side to the second side via the vent.

The above features recited in each of independent claim 1 and 24, allows CO_2 generated in an anode chamber of a fuel cell to evolve through the membrane electrolyte to the cathode chamber. Such a feature simplifies fuel cell design in that gas separation devices may be eliminated from a fuel cell system (e.g., a recirculating direct methanol fuel cell).

Specifically, with regard to Bahar et al., this reference does not contain a material for conducting gas. Assuming, *arguendo*, that the ePTFE the is a material capable of conducting gas by itself, it cannot do so as disclosed in the reference since that material is impregnated with the ion exchange material – i.e., the pores of the ePTFE are filled and thus cannot conduct any gas. Moreover, the disclosure explicitly states that the composite membrane is gas "impermeable".

With regard to Hards et al., Applicants do not understand how this disclosure is akin to

a membrane electrolyte, as one product conducts ions and gas (the claimed invention) and the other conducts electrons (the disclosure)("an electrode"). Applicants respectfully submit, that the portion of the disclosure the Action alleges to disclose a second material for conducting gas from one side to the other side of the membrane electrolyte is actually a gas diffusion layer used with an electrode in fuel cells. The arrangement of the materials in such an electrode, however, do not allow gas to be conducted from one side of the membrane to the other as presently claimed.

With regard to Narayanan et al., this references appears to disclose any type of membrane electrolyte which includes a material for conducting gas from one side to another. Applicants note that the only gas conducting area disclosed is that of vent 127, which exhausts CO_2 from the anode chamber. Applicants could not find reference to a "venting array", nor the plural gas inlets an outlets referred to in the Action.

With regard to Fenton et al., Applicants could also find nothing in this reference that discloses the membrane electrolyte of the present invention. In particular, there is no disclosure as to membrane electrolyte containing a second material organized and arranged in one or more predetermined locations through a first proton conducting material, for conducting a gas from one side of a membrane electrolyte to the other.

Lastly, with regard to Minor et al., each material disclosed which comprise the thin reflective material are not organized and arranged to conduct protons from one side to the other or gas from one side to the other. The material alleged to be the equivalent of the gas conducting material as claimed in the present application, is either applied as a coating to the base material, or used as a filler. Thus, neither the base material nor the coating/filler material is organized and arranged to carry out proton and/or gas conduction.

The remainder of the claims which were rejected under §102 all depend from claim 1, and thus, necessarily incorporate by reference all the features of claim 1. Thus, each of these dependent claims is also patentable for the same reasons.

§103 Rejections

Claims 9-13, 16 and 25-40 were rejected variously under 35 U.S.C. § 103 as being obvious over combinations of: Bahar et al., U.S. patent no. 5,919583 (Grot), Fenton, WO 97/19480A (WO '480), U.S. patent 5,525,436 (Savinell), JP 11-086630-A (JP '630), JP 08-088007-A (JP '007), U.S. patent 5,176,966 (Epp), U.S. patent 5,573,162 (Van Dine), U.S. patent 5,798,186 (Fletcher), U.S. patent 4,248,682 (Lindstrom). In particular, independent claim 25 was rejected as being obvious over Epp et al. in view of either Bahar et al. or Fenton. Independent claims 25, and 34, 35 and 38 were rejected as being obvious over Narayanan in view of either Bahar et al. or Fenton.

With regard to dependent claims 9-13 and 16, these claims have been distinguished from the prior art for the reasons cited in the above analysis of the §102 rejection. Thus, withdrawal of this rejection as to these particular claims is respectfully requested.

With respect to claims 25-40, Applicants respectfully submit that these claims are also patentable over the cited art for the following reasons.

The Claimed Invention

Claim 25 is directed to a membrane electrode assembly for a fuel cell system which includes a gas-evolving, protonically conductive membrane electrolyte having a first side exposed to an anode chamber of the fuel cell system and a second side exposed to a cathode chamber of the fuel cell system. The membrane includes a first material for conducting protons and a second material for evolving gas from one side of the membrane to the other. The assembly also include a first catalyst positioned proximate the first side of the membrane electrolyte, an anode gas diffusion layer positioned proximate the anode electrode, a second catalyst positioned adjacent the second side of the membrane electrolyte and a cathode gas diffusion layer positioned proximate the cathode electrode.

Claim 34 is directed to a fuel cell having a housing and a membrane electrode assembly disposed within the housing forming an anode chamber and a cathode chamber. The membrane

electrolyte assembly includes: a gas-evolving, protonically conductive membrane electrolyte having a first side exposed to an anode chamber of the fuel cell system and a second side exposed to a cathode chamber of the fuel cell system, a first catalyst positioned proximate the first side of the membrane electrolyte, an anode gas diffusion material positioned proximate the anode electrode, a second catalyst positioned adjacent the second side of the membrane electrolyte and a cathode gas diffusion material positioned proximate the cathode electrode. The gas may evolve from one side of the membrane to the other.

Claim 35 is directed to a fuel cell system including a fuel delivery device, a fuel source having carbonaceous fuel, the source in communication with the fuel delivery device, an anode chamber having an inlet for receiving a fuel mixture from the fuel delivery device and an outlet for returning unreacted fuel to the fuel delivery device, a cathode chamber having an inlet for allowing an oxidant to flow into the cathode chamber, a first outlet for exhausting gaseous effluent and a second outlet for directing water effluent to the fuel delivery device and a membrane electrolyte positioned between the anode chamber and the cathode chamber. The membrane includes a first material for conducting protons from the anode chamber to the cathode chamber and a second material for conducting gas from the anode chamber to the cathode chamber.

Claim 38 is directed to a fuel cell system having a fuel delivery device, a fuel source in communication with the fuel delivery device, an anode chamber having an inlet for receiving a fuel mixture from the fuel delivery, a cathode chamber having an inlet for allowing an oxidant to flow into the cathode chamber and an outlet for exhausting effluent out of the cathode chamber and a membrane electrolyte positioned between the anode chamber and the cathode chamber. The membrane includes a first material for conducting protons from the anode chamber to the cathode chamber and a second material for conducting gas from the anode chamber to the cathode chamber.

Accordingly, it is a feature of each of the above independent claims, that CO_2 gas generated in a fuel cell in the anode chamber may evolve/pass through the membrane electrolyte to the cathode chamber. The gas may then be vented from the cathode chamber.

The Prior Art

Applicants' understanding of the references which will be distinguished from the claimed invention with regard to the §103 rejections is set out above, save for the reference to Epp et al. Accordingly, Applicants understand Epp et al. to be directed to a fuel cell membrane electrode and seal assembly, having gas diffusion layers. The gas diffusion layers allow gas to diffuse over a respective side of the membrane electrolyte. Thus, in a cathode, for example, oxygen diffuses over the surface of the membrane electrolyte so that it can react with a proton coming through the membrane electrolyte from the anode chamber.

Analysis

Applicants could find nothing in any of the cited prior art references, when taken alone or in combination, which would have taught or suggested to one or skill in the art at the time the invention was made of either a membrane electrode assembly, a fuel cell or a fuel cell system, which includes a gas evolving membrane electrolyte, which allows gas generated in one chamber to pass through the membrane and into the other chamber.

At most, the prior art references merely disclose, teach and suggest gas diffusion layers for membrane electrodes used adjacent a membrane electrolyte for diffusing gases (e.g., oxygen, carbon-dioxide) over a respective side/surface of the membrane electrolyte. However, none of any of the references cited or of record, alone or in combination, disclose, teach or suggest the claimed gas evolving feature.

For at least those reasons, independent claims 25, 34, 35 and 38 are patentable over the prior art. Since the remaining claims in the §103 rejections are all dependent upon one or another of these independent claims, they are believed patentable for the same reasons.

CONCLUSION

In view of the foregoing remarks, Applicants submit that all the issues raised in the outstanding Action have all been addressed. Accordingly, Applicants respectfully request favorable reconsideration and early passage to issue of the present application.

Applicants respectfully requests that should the Examiner have additional concerns and reasons for unpatentability, that the Examiner contact Applicants' appointed representatives to discuss the issues. To that end, Applicants respectfully request that the Examiner contact the undersigned attorney when he is ready to re-examine the subject application so that Applicants representatives may prepare to discuss the subject application with the Examiner.

No fee is currently due for the present response. However, in the event that it is determined that additional fees are due, the Commissioner is hereby authorized to charge the undersigned's Deposit Account No. 50-0311.

Applicants' undersigned attorney may be reached in our New York office by telephone at (212) 935-3000. All correspondence should continue to be directed to our address given below.

Respectfully submitted,

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